

Multilevel Analysis on the Factors Associated with Low Birth Weight in Temanggung, Central Java

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ABSTRACT

Background: Infants with low birth weight or LBW is one of the risk factors for infant mortality. Complications LBW actually can be prevented and dealt with, but is constrained by access to health care, socio-economic circumstances, a referral system that has not gone well, delays in early detection and awareness of parents to seek medical help. By looking at the number of deaths caused by LBW remains high, and research on the causes of LBW widely used partial analysis, and have not been analyzed in stages, the researchers conducted this research with multilevel analysis.

Subjects and Method: This was an observational study with case control design. A total sample of 120 infants were selected by fixed disease sampling with a ratio of 1: 2 between cases and controls. Data were analyzed using multiple logistic regression.

Results: There are three variables at the individual level were significantly associated with LBW and was statistically significant can among others, mother's education (OR= 0.19; 95% CI= 0.07 to 0.53; p= 0.001), history of ANC t (OR= 7.76; 95% CI= 2.18 to 27.62; p= 0.002) and the nutritional mother status (OR= 5.61; 95% CI= 0.21 to 0.79; p= 0.008) and the variables that are not statistically significant is the mother's age and family income, and there are no contextual role within house with wellness facilities with LBW expressed by ICC < 0.001.

Conclusion: The influence of maternal education, a history of the ANC examination and nutritional status of mothers with LBW and there is no contextual role of distance between home and health care facilities with LBW. This study suggests to health professional to improve the coverage of the ANC.

Keywords: multilevel analysis, factor low birth weight

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BACKGROUND

Infants with low birth weight or LBW is one of the risk factors for infant mortality. Complications LBW actually can be prevented and dealt with, but is constrained by access to health care, socio-economic circumstances, a referral system that has not gone well, delays in early detection and awareness of parents to seek medical help. Percentage of LBW in Central Java in 2014 was (3.9%), it increased compared to 2013 (3.75 %) (Kemenkes RI, 2015; Dinkes Jateng, 2015).

Factors that influence LBW incidence among others are social factor includes:

family income, education, residential location. Maternal factors includes: mother's age at time of delivery, body height, maternal disease during pregnancy, maternal BMI, space between pregnancies, regularity in doing ANC visits. Environmental factor includes: the use of firewood to cook, washing hand only with water, the absence of separated kitchen. Fetal factor includes: disease factor, placenta factor (Demelash et al., 2015; Wiknjosastro, 2005).

Infant Mortality Rate (IMR) in Temanggung Regency area in 2014 was 14.70/1,000 live births, the figure was decreasing

compared to IMR in 2013 that was 15.44/1,000 live births. The most dominant reason of infant mortality in Temanggung Regency in 2014 was LBW (44.26%) (Dinkes Temanggung, 2015).

The result of Indonesia Demography and Health Census 2012 obtained that perinatal mortality was higher in rural regions than in urban regions (33 compared to 20 deaths per 1,000 pregnancies), however it was different with the occurrence in the working area of Temanggung Health Office. In the working area of Temanggung Health Office there were some rural areas that had lower mortality compared to urban area. Seeing that the mortality rate for LBW was still high and studies on LBW's causal factors commonly used partial analysis, and was not yet analyzed in multilevel therefore researchers would carry out the study using multilevel analysis. By using multilevel analysis it would be able to find out which factor in which level that give big contribution in the occurrence of LBW.

SUBJECTS AND METHOD

1. Study design

This was an observational analytic study with case control design. The study was conducted within the working area of

Table 1. The result of logistic regression with multilevel approach on the influence of maternal age, maternal education, family income, maternal nutrition status, distance from home to healthcare facility toward the risk of LBW incidence

Independent Variable	OR	CI 95%		p
		Lower Limit	Upper Limit	
Fixed Effect:				
- Maternal Age	1.47	0.42	5.14	0.544
- Maternal Education	0.19	0.07	0.53	0.001
- Family Income	1.88	0.66	5.34	0.232
- ANC history	7.75	2.18	27.61	0.002
- Maternal nutrition status	5.61	0.21	0.78	0.008
Random Effect:				
Distance from home to healthcare facility				
Var (constant)	< 0.001			
Intraclass correlation	< 0.1 %			
Likelihood Ratio	-59.9241			

Health Office of Temanggung Regency in 2016.

2. Population and Sample

The research population was infants who were born in November 2015 up to January 2016. The sample was selected using fixed disease sampling, a total sample was 120 infants, divided into case group (40) and control group (80).

3. Data Analysis

Data analysis was conducted by using univariate, bivariate with chi square, and multivariate with logistic regression by using multilevel analysis approach.

RESULTS

Subjects in this study were categorized into 2 groups namely LBW Infants in case group (33.3%) and normal infants in control group (66.7%). Maternal age was categorized into 2 namely at-risk age <20 years and ≥35 years (18.3%) non at risk age, which was 20-35 years (81.7%). Maternal education was categorized into 2 namely primary education (55%) and secondary education (45%). Family income was categorized into 2 namely less than regional minimum wage (29.2%) and regional minimum wage (70.8%).

ANC history was categorized into 2 namely ANC history <4 times (14.2%) and ≥ 4 times (85.8%). Maternal nutrition status was categorized into 2 namely Chronic Energy Deficient (CED) (20%) and non CED (80%). Distance from home to healthcare facility was categorized into 2 namely near health facility (64.2%) and far from health facility (35.8%).

In multivariate, influence elaborated the influence of more than one independent variable namely maternal age, maternal education, family income, ANC history, maternal nutrition status, and distance from home to healthcare facility toward one dependent variable namely risk for low birth weight incidence. The method used was logistic regression with multilevel approach by using STATA 13 program.

DISCUSSION

There was an influence of maternal age on incidence of LBW however it was stated as statistically insignificant (OR= 1.47; CI 95%= 0.42 to 5.15; $p= 0.544$). Maternal age which was less than 20 years also more than 35 years was at risk of enduring LBW 1.4 times bigger than 20-35 years old. It is more susceptible to pregnancy complication at the age of less than 20 or more than 35 years old, however it will be corrected by doing regular pregnancy monitoring and examination, so that the pregnancy process and fetal development will optimally occur. Freser et al., in Cunningham (2006), states that adolescent pregnancy is more risky since it seldom obtains preconception counseling, however if the counseling is obtained in the beginning of pregnancy it is still possible to be beneficial for the pregnancy. Healthcare service and counseling, including nutrition for healthy pregnancy, is one of the concept of integrated antenatal service.

Governmental program namely integrated antenatal service and pregnancy class are already implemented in the working area of Health Office of Temanggung Regency. It is in accordance with the purpose of the program which is to meet the quality of antenatal care to be able to go through the pregnancy healthily, and deliver the baby safely and deliver to a healthy baby, therefore the program is able to early detect the occurrence of abnormality within pregnancy. Age has influence in the incidence of LBW however it is statistically insignificant, since there is an intervention in program to prevent LBW incidence. With the existence of the intervention women who are less than 20 or more than 35 will get excellent monitoring and will get the appropriate management so there won't be any birth with LBW infants.

Education which was less than high school had 0.2 bigger risk to deliver infants with LBW compared to women with high school and university background and was statistically significant (OR= 0.20; CI 95%= 0.072 to 0.530; $p=0.001$). The study conducted by Djaali dan Eriyando (2010), also finds that maternal education influence infants' birth weight to be born. The higher maternal education is, the lower is incidence of LBW since the higher maternal education is, the better is maternal knowledge in pregnancy care.

Level of education extremely influence maternal mindset in determining the pregnancy care, the higher maternal education is, the easier is receiving information and implementing good pregnancy care. On mothers with low level of education it will be difficult to receive information and existing program for pregnancy care. Women with low education are likely to ignore their pregnancy care and do not go for pregnancy examination, so that it is

unable to recognize the early signs of emerging deviation.

The study is also in accordance with Demelesh et al., (2015) study, which states that women with low education is likely to have 6 times bigger risk for giving birth to LBW infants than women with high education (OR= 6; 95% CI= 1.34 to 26.90).

There was an influence of Family income on LBW incidence, although it was statistically insignificant. Family whose income was under regional minimum wage was likely to have 1.8 times bigger risk compared to family whose income was bigger or equal to regional minimum wage with (OR= 1.88; 95% CI= 0.66 to 5.34; $p=0.232$).

In Health Minister Regulation No. 28/ 2014 about Implementation guide for National Health Insurance Program, it is explained that patients of Aid Recipients receive the same rights to obtain similar service, in this term is examination of pregnancy, childbed, breastfeeding mother, infants, and toddlers by midwives or doctors, is included into primary care, therefore under privileged family in the study is identified as family with income less than regional minimum wage who remain receive pregnancy examination similar to patients from privileged family by using BPJS PBI (aid recipients). By using BPJS PBI, family with less income keep getting the right to get similar healthcare service, in this term is remain able to access antenatal service regularly.

Pregnancy examination plays important roles in ensuring that pregnancy may go well and recognizing the occurrence of complication. In integrated antenatal care health personnel must be able to ensure that the pregnancy grows normally and early recognize the complication as well as the appropriate management. With the occurrence of right equity to obtain

pregnancy examination therefore family income does not influence on LBW.

Pregnancy examination history which was not in accordance with standard (<4 times) held 7.7 times bigger risk to give birth with LBW than standard pregnancy test. The history of pregnancy examination was also stated as statistically significant with $p= 0.002$ (OR=7.76; CI=2.18 to 27.62). The result of the study is in accordance with the study conducted by Ninggsih (2009), that ANC examination <4 times increase by 10.17 times to give birth to LBW infants (CI 95%= 5.48 to 13.42; $p= 0.002$).

ANC visits <4 times may increase LBW incidence since early detection of pregnancy deviation and abnormality may not be conducted from the beginning so that low birth weight could not be corrected. In accordance with the purpose of integrated antenatal service that is early detecting deviation/ disorder/ disease that a pregnant women endure as early as possible, so that LBW incidence may get avoided by doing regular ANC examination. ANC examination is conducted in accordance with the standard that is 4 times at the minimum during pregnancy (Kemenkes, 2010).

Maternal nutritional status during pregnancy held influence toward LBW incidence, women with insufficient nutritional status held 5.5 times bigger risk than women with sufficient nutritional status and statistically significant (OR= 5.61; 95% CI= 0.21 to 0.79; $p= 0.008$). insufficient nutritional status in the study was stated in Mid-Upper Arm Circumference (MUAC) category, less than 23.5 cm indicated CED, more than 23.5 indicated non CED. The result of the study is in accordance with a study conducted by Ruji (2009), in which it find that MUAC <23.5 cm

holds 4.89 times higher risk for giving birth to LBW infants.

Maternal nutritional status is very important for the pregnancy, in the state of nutrition deficiency, nutrient deposit of the mother will not be sufficient to support the growth and development of fetus and maternal health. In this state of condition placenta does not develop well therefore it is not capable in supplying adequate nutrient for fetal needs the possible impact that may happen are hampered fetal development, birth defect, miscarriage or stillborn, premature, or low birth weight infant (LBW). In addition, if it happens to female infant, in the future it will hinder the ability to deliver healthy baby (Almatsier, 2011).

The result of the study found that the ICC <0.1%, the indicator showed that distance from home to healthcare facility did not affect the incidence of LBW. The result of multilevel analysis with ICC was smaller than 8% it means that there was no relation on environment level in the study, in terms of either far or close is the distance of home from healthcare facility, toward LBW incidence. The result of the study did not found any difference of LBW incidence on the level of environment that was the distance from home to healthcare facility whether it was close or far. The working area of Temanggung Health Office has had road facility and sufficient transportation, whether in rural or urban area, so that the access to healthcare facilities is getting accessible despite the long distance to travel. The road and transportation condition were getting better therefore the implementation of ANC examination and pregnancy class were also getting improved. In addition to the road condition which was getting better, the occurrence of village midwives program also brought society closer to healthcare service especially maternal and child health.

There was influence between LBW toward maternal age (OR= 1.47; 95% CI= 0.42 to 5.15; p= 0.544), maternal education (OR= 0.20; 95% CI= 0.07 to 0.53; p= 0.001), family income (OR= 1.89; CI 95%= 0.66 to 5.34; p= 0.232), ANC history (OR= 7.76; 95% CI= 2.18 to 27.62; p= 0.002), maternal nutritional status (OR=5.61; 95% CI= 0.21 to 0.79; p= 0.008) and the distance between home to healthcare facility with constant variables <0.001.

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